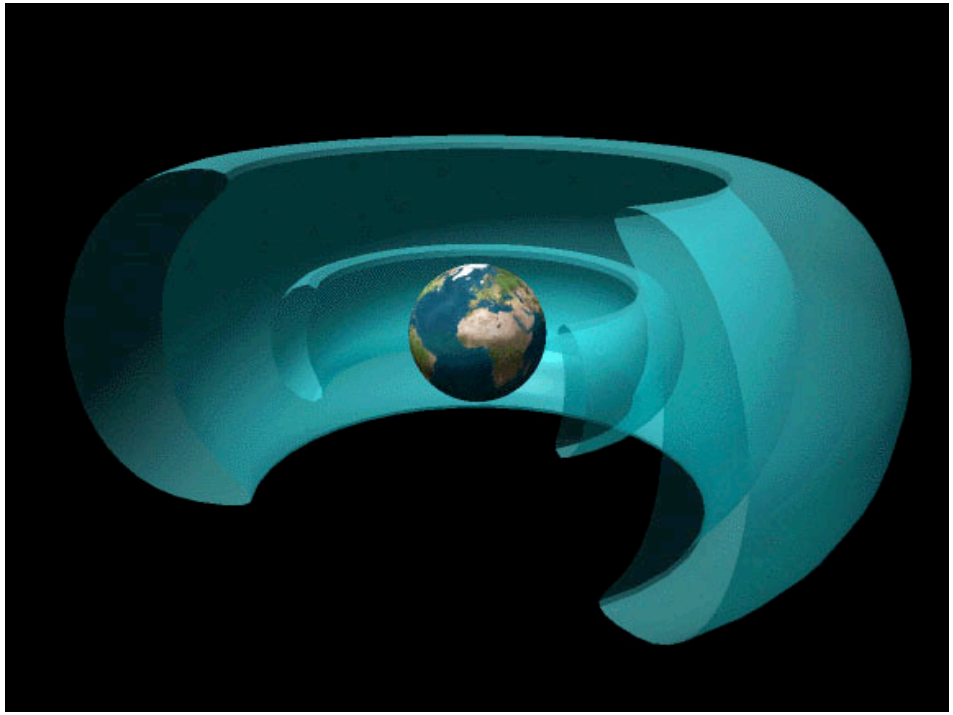
Radiation Belt Mappers



Mission Description

The Radiation Belt Mapper mission will employ a set of satellites in low inclination orbits to provide a large scale, time dependent mapping of particles and fields in the Earth's inner magnetosphere, with special emphasis on the radiation belt environment.

RADIATION BELT MAPPERS

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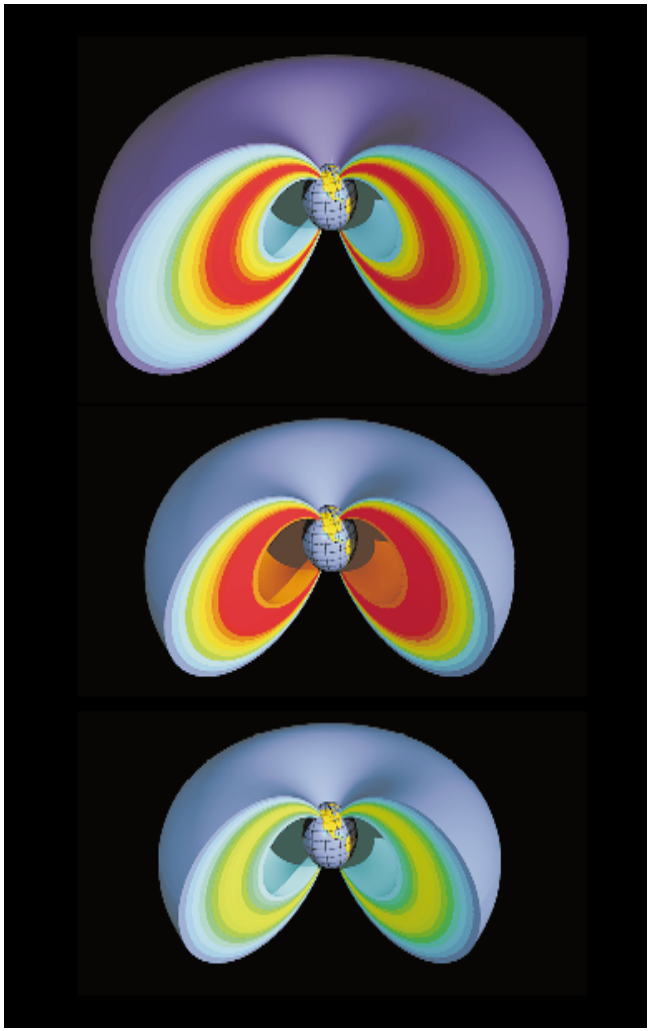
Science Objectives

- Discover the acceleration mechanisms responsible for radiation belt creation
- Determine the sources and dynamics of high energy particle populations
- Determine the development and evolution of magnetic storms
- Enable time-dependent theoretical models of the inner magnetosphere, radiation belts, and plasma sphere



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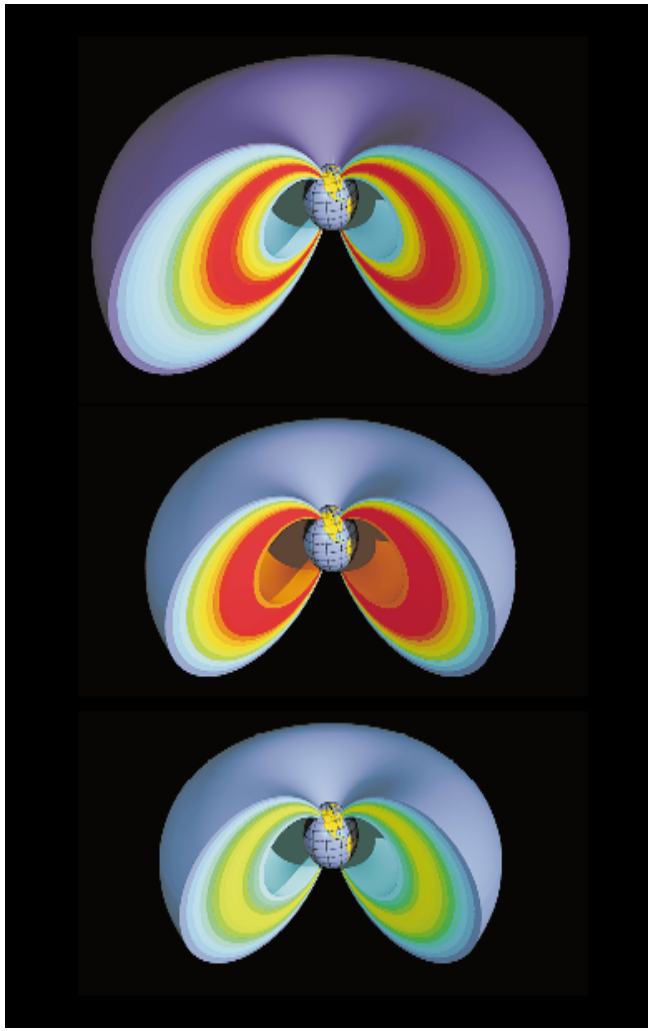
Space Weather Applications

- Provide climatology of radiation belt particle populations
- Provide nowcasting of high energy particle population in the inner magnetosphere
- Support the development of predictive models of the high energy particle population in the inner magnetosphere, also for CCMC.
- Fully specify and understand the space environment to increase spacecraft reliability, failure assessment, and astronaut safety



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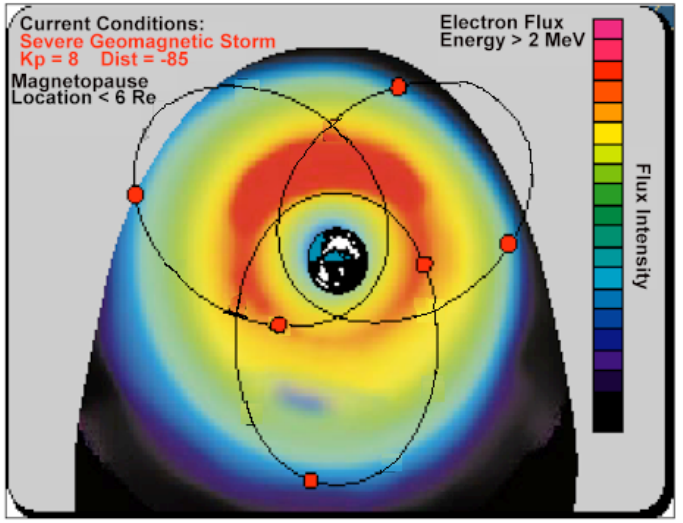
CONCEPT/CONFIGURATION

- A constellation of 6 small, largely identically configured spacecraft (microsatellite class) distributed in 3 petal orbits around the magnetic equator of the Earth
- Each spacecraft spinning at a rate of 6 to 12 RPM with its spin axis normal to the plane of the ecliptic
- Single launch with dispenser
- Replication of instruments and spacecraft to the fullest extent possible to minimize non-recurring engineering costs



RADIATION BELT MAPPERS

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Launch Date: 2009

Description: A large scale, time-dependent mapping of particles and fields in the Earth's inner magnetosphere.

Instruments: Satellite instrumentation to include a plasma analyzer, energetic particle detector(s), and a vector magnetometer. At least one s/c to include an electric field instrument.

Spacecraft: A total of 6 small spacecraft or microsatellites each with its spin axis normal to the ecliptic in 2x6.5 R_E close to equatorial orbits. 360 degree coverage in longitude desirable.

Mission Life: 4 years for full constellation.

Orbit: 2x6.5 R_E with three lines of apsides spread around in longitude.

Space Access: One launch on a Medium Class ELV.

Key Technologies: Miniaturized instruments tolerant of a high radiation environment, integrated sensor/spacecraft systems.

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Focus Area	Science Question	Space Weather Application	Measurement Requirement	Status
Plasma and magnetic field dynamics	What are the plasma sources? How is the thermal plasma accelerated?	Prediction and modeling of energetic particle acceleration	Vector magnetic field Thermal plasma 10eV-30keV Electric field	Mature Miniatur. required
Energetic electrons	What is the distribution of energetic electrons? What are the acceleration mechanisms?	Radiation nowcasting Climatology Development of predictive capability	Energetic electrons, 30keV-5MeV	Mature
Energetic ions	What is the distribution of energetic ions? What are the acceleration Mechanisms?	Radiation nowcasting Climatology Prediction with magnetic field dynamics	High 30keV-1MeV and very high (to 200MeV) ions	Mature